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WITNESS my hand this
Twenty-third day of November 2006

J. H. Bryde

JANENE BRYDE
MANAGER EXAMINATION SUPPORT
AND SALES

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PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

Retaining Wall Block

Name and Address of Applicant: Keystone Retaining Wall Systems, Inc., of 4444 West 78th Street, Bloomington, Minnesota, 55311, UNITED STATES OF AMERICA

Name of Inventors: Robert A MacDonald and Robert J Race

This invention is best described in the following statement:

5805

Retaining Wall Block

Field of the Invention

The present invention is directed to the field of retaining walls and blocks used to construct a retaining wall.

Background to the Invention

Numerous methods and materials exist for the construction of retaining walls. Such methods include the use of natural stone, poured in place concrete, masonry, and landscape timbers or railroad ties. In recent years, segmental concrete retaining wall units which are dry stacked (i.e., built without the use of mortar) have become a widely accepted product for the construction of retaining walls. Examples of such products are described in Forsberg, U.S. Patent No. Re. 34,314 and Sievert, U.S. Patent No. 5,294,216. Such products have gained popularity because they are mass produced, and thus relatively inexpensive. They are structurally sound, easy and relatively inexpensive to install, and couple the durability of concrete with the attractiveness of various architectural finishes.

The retaining wall system described in Forsberg, U.S. Patent No. Re. 34,314 has been particularly successful because of its use of block design that includes, among other design elements, a unique pinning system that interlocks and aligns the retaining wall units, allowing structural strength and efficient rates of installation. This system has also shown considerable advantages in the construction of larger walls when combined with the use of geogrid tie-backs hooked over the pins, as described in Forsberg, U.S. Patent No. 4,914,876.

The construction of modular concrete retaining walls as described in Forsberg involves several relatively simple steps. First, a levelling pad of dense base material or unreinforced concrete is placed, compacted and levelled. Second, the initial course of blocks is placed and levelled. Two pins are placed in each block into the pin holes. Third, core fill material, such as crushed rock, is placed in the cores of the blocks and spaces between the blocks to encourage drainage and add mass to the wall structure. Fourth, succeeding courses of the blocks are placed in a "running bond" pattern such that each block is placed between the two blocks below it. This is done by placing the blocks so that the receiving cavities of the bottom of the block fit over the pins that have been placed in the units in the course below. As each course is placed, pins are placed in the blocks, the blocks are corefilled with drainage rock, and the area behind the course is backfilled and compacted until the wall reaches the desired height.

If wall height or loading conditions require it, the wall structure may be constructed using reinforced earth techniques such as geogrid reinforcement,

geosynthetic reinforcement, or the use of inextensible materials such as steel matrices. The use of geogrids are described in Forsberg, US Patent No. 4,914,876. After placement of a course of blocks to the desired height, the geogrid material is placed so that the pins in the block penetrate the apertures of the geogrid. The geogrid is then laid back into the area behind the wall and put under tension by pulling back and staking the geogrid. Backfill is placed and compacted over the geogrid, and the construction sequence continues as described above until another layer of geogrid is called for in the planned design. The use of core fill in the blocks is known to enhance the wall system's resistance to pull out of the geogrid from the wall blocks when placed under pressure.

Existing segmental wall block designs have proven quite versatile, but have limitations in constructing certain structures. A common design detail for retaining wall structures is to include a fence or guardrail at the top of the retaining wall. Many segmental wall designs are not able to accommodate the anchoring posts for such structures. Similarly, it is not always feasible to extend geosynthetic reinforcement behind a wall. This may occur due to the presence of a structure or a property line immediately behind the wall. Most existing modular walls blocks cannot be constructed through the use of grout and rebar reinforcement.

There is a need for a retaining wall block that improves on the Forsberg design. Since the blocks are usually placed through manual labour, it would be desirable to decrease the weight of the Forsberg design without compromising the performance characteristics of the block. Because the placement of corefill is an important factor influencing wall construction efficiency, it would be desirable to improve the ease with which core fill may be placed. It would also be desirable to improve the Forsberg blocks' ability to resist pull out of geosynthetic reinforcement placed between courses of the blocks. It would also be desirable to have a wall block design that would allow construction of such common construction details as the placement of guardrail posts or fence posts at the top of the wall, or the provision of pilasters for aesthetic or other purposes. It would also be desirable to provide a block that would allow the wall to be reinforced with rebar and concrete grout rather than soil reinforcement.

Object of the Invention

It is an object of the present invention to provide an improved retaining wall block satisfying at least one of the above desires.

Summary of the Invention

In one broad form the present invention provides a retaining wall block having parallel top and bottom faces, a front face, a rear face, first and second side wall faces and a vertical plane of symmetry extending between said front and rear faces,

said block comprising:

a body portion including said front face,

a head portion including said rear face,

a neck portion connecting said body portion and said head portion, said body, head and neck portions each extending between said top and bottom faces and between said first and second side wall faces,

an opening extending through said neck portion from said top face to said bottom face, said opening dividing said neck portion into first and second neck wall members extending rearwardly from said body portion to said head portion,

first and second pin holes each disposed in said body portion and opening onto said top face for receiving a pin with a free end of the pin protruding beyond said top face,

first and second pin receiving cavities each disposed in said body portion and opening onto said bottom face for receiving the free end of a pin received in a pin hole of an adjacent block disposed therebeneath so as to interlock the blocks with a predetermined setback,

wherein said neck wall members, said pin holes and said pin receiving cavities are positioned such that a first plane extending parallel to said plane of symmetry passes through said first pin receiving cavity, said first pin hole and said first neck wall member and a second plane extending parallel to said plane of symmetry passes through said second pin receiving cavity, said second pin hole and said second neck wall member.

Typically said first and second neck wall members are each positioned so as to substantially vertically align, in use, with a said neck wall member of a vertically adjacent block in an adjacent courses of a wall made from a plurality of courses of said blocks laid in a running bond pattern.

Typically said first and second planes are located approximately midway between said plane of symmetry and laterally outermost points of said first and second said wall faces respectively.

Preferably said first and second pin receiving cavities each have a rear wall extending generally perpendicularly to said plane of symmetry.

Preferably said block further comprises third and fourth pin holes each disposed in said body portion and opening onto said top face for receiving a pin with a free end of the pin protruding beyond said top face, said third and fourth pin holes being

disposed on said first and second planes forward of said first and second pin holes so as to provide a reduced or zero predetermined setback.

Preferably said side wall faces generally taper from said front face to said rear face.

Preferably said head portion has first and second ears extending laterally beyond said first and second neck wall members respectively, said first and second ears each being provided with a notch to enable said ears to be knocked off said head portion.

The present invention further provides a retaining wall formed of a plurality of courses of said blocks laid in a running bond pattern, blocks of a given course each having a pair of pins each projecting beyond said top surface of said block and engaging said pin receiving cavity of a vertically adjacent said block in the next lowermost course, a continuous cavity being defined by each said opening of vertically aligned blocks in every second course of said blocks communicating with side voids of vertically adjacent blocks in each alternate course, said side voids of a block being defined between said head and body portions either side of said neck portion of the block.

The retaining wall may be a straight wall, a curved wall or a serpentine wall.

The retaining wall may be reinforced with rebar and grouting, a length of said rebar passing through each of at least one of said cavities, each length of said rebar being secured in the respective said cavity with said grout.

The retaining wall may incorporate at least one post each extending into a said continuous cavity and protruding from the top course, each of said at least one post being secured in the respective said cavity with grout.

The retaining wall may incorporate a geogrid tie-back disposed between two adjacent said courses, said geogrid tie-back being secured with said pins passing through apertures thereof.

The retaining wall may incorporate a pilaster formed of a column of said blocks set forward from the remainder of said wall.

Description of the Drawings

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is a plan view of a retaining wall block.

Figure 2 is an inverse plan view of the retaining wall block of Figure 1.

Figure 3 is an isometric view from above and in front of the retaining wall block of Figure 1.

Figure 4 is an isometric view from below and behind of the retaining wall block of Figure 1.

Figure 5 is a plan view of a three interlocked retaining wall blocks.

Figure 6 is a plan view of an alternative retaining wall block.

Figure 7 is an inverse plan view of the alternative retaining wall block of Figure 6.

Figure 8 is a perspective view of a retaining wall built of the retaining wall block of Figure 1.

Figure 9 is a plan view of a section of the retaining wall of Figure 8.

Figure 10 is a front elevation view of a pin for use with a retaining wall block.

Figure 11 is a plan view of two retaining wall blocks laid in a tight convex curve.

Figure 12 is a plan view of the retaining wall blocks of Figure 11 with a third block interlocked therewith.

Figure 13 is a perspective view of a retaining wall similar to that of Figure 8 but reinforced with rebar and grout.

Figure 14 is a perspective view of a retaining wall similar to that of Figure 8 but incorporating a geogrid tie-back and fence posts.

Figure 15 is a plan view of a section of the retaining wall of Figure 14.

Figure 16 is a perspective view of a retaining wall similar to that of Figure 8 but incorporating a pilaster.

Detailed Description of the Preferred Embodiment

Referring to Figures 1-4 there is shown a retaining wall block 1 according to a preferred embodiment of the present invention. The block 1 is made of a rugged, weather resistant material, preferably pre-cast concrete. Other suitable materials are plastic, reinforced fibres, wood, metal and stone. The block 1 has parallel top and bottom faces 2, 3, a front face 4, a rear face 5 and first and second side wall faces 6, 7. The front and rear faces 4, 5 each extend from the top face 2 to the bottom face 3 and the side wall faces 6, 7 extend from the top face 2 to the bottom face 3 and from the front face 4 to the rear face 4. The block 1 is generally symmetrical about a vertical plane of symmetry S.

The integrally formed block 1 takes the form of a body portion 8, a head portion 9 and a neck portion 10 connecting the body portion 8 and the head portion 9. The front face 4 forms part of the body portion 8, whilst the rear face 5 forms part of the head portion 9. The body, head and neck portions 8, 9, 10 each extend between the top and bottom faces 2, 3 and between the first and second side wall faces 6, 7. The side wall faces 6, 7 are thus of a compound shape and define side voids 11, 12 between the body and head portions 8, 9 either side of the neck portion 10 as a result of the reduced width of the neck portion 10 compared to that of the body and head portions 8, 9.

An opening 13 extends through the neck portion 10 from the top face 2 to the bottom face 3. The opening 13 divides the neck portion 10 into first and second neck

wall members 14, 15 which extend rearwardly from the body portion 8 to the head portion 9. The opening 13 and the side voids 11, 12 reduce the weight of the block 1, facilitating handling thereof.

The opening may be provided with a ledge 37 toward the top face 2 covering the forward portion of the opening 13, however this ledge 37 is dispensed with in an alternate embodiment of the block 1' depicted in Figures 6 and 7, leaving the opening 13' of constant cross section throughout its depth from the top face 2' to the bottom face 3', further reducing the weight of the block 1'.

First and second pin holes 16, 17 are disposed in the body portion 8 and open onto the top face 2. The pin holes 16, 17 are sized to receive a pin 50, 51 (discussed below) with a free end of the pin protruding beyond the top face 2. The pin holes 16, 17 will also typically extend through to the bottom face 3 as a result of the preferred method of manufacture discussed below. First and second pin receiving cavities 18, 19 are disposed in the body portion 8 and open onto the bottom face 3. The pin receiving cavities 18, 19 receive the free ends of pins protruding from pin holes of vertically adjacent blocks disposed therebeneath in the next uppermost course so as to interlock the blocks with a predetermined setback in the same general manner as that described in the earlier Forsberg patent, U.S. Patent No. Re. 34,134. The first and second pin holes 16, 17 (or more preferably additional third and fourth pin holes 29, 30 discussed below) may be positioned such that the predetermined setback is zero.

The neck wall members 14, 15, pin holes 16, 17 and pin receiving cavities 18, 19 are positioned such that a first plane P1 extending parallel to the plane of symmetry S passes through the first pin receiving cavity 18, the first pin hole 16 and the first neck wall member 14 and such that a second plane P2 extending parallel to the plane of symmetry S passes through the second pin receiving cavity 19, the second pin hole 17 and the second neck wall member 15.

The effect of this configuration is best described with reference to Figure 5 which depicts a first block 1A interlocked with second and third blocks 1B, 1C disposed therebeneath and laid in a running bond pattern with the first block 1A set back from the second and third blocks 1B, 1C. Pins 50 are received in the second pin receiving hole 17B of the second block 1B and the first pin receiving hole 16C of the third block 1C and respectively engage the first and second pin receiving cavities 18A, 19A of the first block 1A so as to provide the interlock between the blocks with the predetermined setback. As can be seen, the configuration ensures that the neck wall members of adjacent blocks overlap. The first neck wall member 14A of the first block 1A overlaps the second neck wall member 15B of the second block 1B, whilst the second neck wall member 15B of the first block 1A overlaps the first neck wall member 14C of the third block 1C. This overlap provides continuity of structure in the neck region between courses of blocks enabling transfer of compressive loads in this area through successive

courses of blocks, minimizing the bridging of unsupported areas. Structural integrity of the wall can hence be achieved with a lighter mass block with increased opening 13 and void areas 11, 12, as an increased proportion of the material of the block is able to transfer load between blocks.

The configuration also provides overlap between the opening 13A of the first block 1A and the side voids 12B, 11C of the second and third blocks 1B, 1C, as well as between the side voids of the first block 1A and the openings 13B, 13C of the second and third blocks 1B, 1C. This overlap provide continuous cavities 38 in the wall which extends through successive courses of blocks, improving the ease with which the cavities can be filled with core fill material such as crushed rock to encourage drainage and add stabilising mass to the wall or alternatively easing placement of grout. The continuous cavities 38 also allow for the placement of guardrail posts or fences at the top of a wall as described below, or for the reinforcement of the wall with rebar and concrete grout as is also discussed below.

Beyond merely overlapping, it is preferred that the first and second neck wall members 14, 15 are positioned so that they will substantially vertically align with the neck wall members of blocks in adjacent courses when laid in a running bond pattern, as is the case with the current preferred embodiment. Such vertical alignment maximises the resistance of the blocks against crushing when used in extremely tall walls. This will best be achieved if the first and second planes P1, P2 run along or close to planes N1, N2 running generally centrally though the first and second neck wall members 14, 15 respectively. To provide such vertical alignment and to ensure blocks disposed side by side in a given course of blocks are closely adjacent without any significant gap therebetween, the first and second planes P1, P2 will typically be located approximately midway between the plane of symmetry S and laterally outermost points 20, 21 of the first and second side wall faces 6, 7 respectively.

In the depicted preferred embodiment, as best seen from Figure 1, the plane N1, N2 running generally centrally through each of the neck wall members 14, 15 lies midway between the plane of symmetry S and the laterally outermost points 20, 21, whilst the first and second planes P1, P2 lie slightly outboard of the planes N1, N2, a distance equal to 1.5-2% of the overall width of the block. This can also be seen in Figure 5 where the central planes (not marked) of the overlapping neck wall members align, resulting in the pin holes of adjacent blocks being slightly offset. The neck wall members need not extend parallel to the plane of symmetry S so as to provide symmetry about planes N1, N2, so long as planes P1, P2 extend along the length of the neck wall members 14, 15 so as to provide continuous support between vertically adjacent blocks.

The first and second pin receiving cavities 18, 19 each have a rear wall 22, 23 which extends generally perpendicularly to the plane of symmetry S, allowing for some

forgiveness in the positioning of blocks with respect to vertically adjacent blocks, allowing the blocks to move slightly out of the bond pattern as a result of corners or curves. Here the pin receiving cavity rear walls 22, 23 are approximately 100 mm (4 inches) long. When the first block 1A of Figure 5 is placed with its pin receiving cavities 18A, 19A over pins 50 protruding from the pin holes 17B, 16C, of the second and third blocks 1B, 1C, the first block 1A is manually pushed forward until the pins 50 engage the pin receiving cavity rear walls 22, 23, thus interlocking the blocks. The generally triangular shape of the pin receiving cavities allows minor lateral adjustments of the blocks whilst maximising the distance between the front edge of the cavity and the front face of the blocks which reduces the possibility of face cracks. The interlocked position defines the set-back between courses of blocks, and is equal to the distance between the pin receiving cavity rear walls 22, 23 and the rear edge of the pin receiving holes 16, 17, assuming a constant cross-section pin 50 is employed. This setback distance can thus be predetermined through the design of the block, and will typically be of the order of 25 mm (1 inch) for a block such as that depicted which has a height of 200 mm (7.9 inches), providing for a setback of approximately 12.5% or 1:8. For given situations however, it may be desired to design the block for a larger setback, a reduced setback or a zero setback.

The pin receiving cavities 18, 19 are here approximately 30 mm deep for reception of a pin free end, which will typically project from the top face 4 of the underlying block by approximately 20 mm. The outer front walls 24, 25 of the triangular shaped pin receiving cavities 18, 19 lie generally parallel to the outer rearwardly angled surfaces 26, 27 of the front face 4, and spaced approximately 38 mm (1.5 inches) therefrom so as to reduce the possibility of face cracking when forming the rough front face 4 with the conventional face splitting technique.

The front face is formed of the angled outer surfaces 26, 27 and a central surface 28 disposed perpendicular to the plane of symmetry S so as to provide for a multi-faceted front face on a wall constructed of the blocks. Alternatively, a variety of front face designs may be used.

Referring to Figures 1 though 4, the preferred block has a pair of third and fourth pin holes 29, 30 disposed forwardly of the first and second pin holes 16, 17 to provide a reduced setback as compared to that provided by the first and second pin holes 16, 17. Here that reduced setback is a zero setback when used with constant cross-section pins 50. The third and fourth pin holes 29, 30 are each disposed in the body portion 8 and open onto the top face 2 for receiving a pin 50 with a free end thereof protruding beyond the top face 2 in a similar manner to the first and second pin holes 16, 17. The third and fourth pin holes 29, 30 are again disposed on the first and second planes P1, P2, each with their rear edge aligned with the corresponding pin receiving cavity rear wall 22, 23 so as to provide zero setback when used with constant cross-section pins

50. Further pin holes can be provided, if desired, so as to provide for further choices of predetermined setback.

A straight retaining wall 100 constructed from the blocks utilising the third and fourth pin holes 29, 30 to interlock the blocks is depicted in Figures 8 and 9. As can be seen, use of the third and fourth pin holes 29, 30, with a constant cross-section pin 50, provides zero or near vertical setback between courses resulting in a vertical wall 100. Half blocks 60 may be used at the lateral ends of the wall 100 in alternate courses to finish the wall in the usual manner if the wall end abuts a vertical surface. Half blocks may be field cut using a masonry saw or cut at the factory. Figure 9 clearly depicts how alignment of the neck wall members of vertically adjacent blocks and consequent alignment of the neck openings 13 with the side voids 11, 12 of vertically adjacent blocks provides continuous cavities 38 extending through the height of the wall 100. Capping blocks are typically used to finish the top of the wall.

Rather than using a constant-cross section pin 50, an alternate and preferred collared pin 51, as depicted in Figure 10, has been developed for use with the current block 1. The lower section 52 of the pin 51 is sized to fit into any of the pin holes 16, 17, 29 or 30, here having a diameter of 12.7 mm (0.5 inches). The upper section 53 is of greater cross section than the lower section 52 (and the pin holes), here having a diameter of 18 mm (0.72 inches) so as to form a collar 54 at the intersection between the upper and lower sections 52, 53. In use, the lower section 52 of the pin 51 is received in a pin hole 16,17, 29 or 30, with the collar 54 engaging the top face 4 of the block 1 preventing the pin 51 from falling through the pin hole and ensuring the upper section 53 forms a free end protruding a fixed amount (here 20 mm) from the pin hole for engaging a pin receiving cavity of an adjacent block laid in the next course. The pin 51 hence need not extend through the entire length of the pin holes to rest on the block beneath or be jammed into the pin hole with an interference fit to hold it in position.

As well as ensuring the location of the pin 51 in the pin hole, the increased diameter upper section 53 increases the setback between adjacent interlocked blocks by the width of the collar, here being approximately 2.6 mm. Use of the collared pin 51 in the third and fourth pin holes 29, 30 will hence provide a minimal setback between courses of about 2.6 mm (or 1.3% for the current block) rather than zero setback as will be provided with a constant cross-section pin 50. A wall constructed in this way will still appear essentially vertical but will have increased stability owing to the setback, albeit only a minor setback. The collared pin design and the relative position of the pin holes with respect to the pin receiving cavities can be adjusted in the design to provide near vertical walls or other desired setbacks.

The block 1 of the preferred embodiment is suitable for forming straight, curved or serpentine walls. To provide for convex faced curved walls and serpentine walls, the side wall faces 6, 7 generally taper from the front face 4 to the rear face 5, such that

the block is wider at the front face 4 between the outermost points 20, 21 than at the rear face 5. This enables the blocks to be placed in a convex curve in the usual manner without interference between the head portion 9 of laterally adjacent blocks. To provide for increased curvature of a convexly curved section of wall, the head portion 9 is provided with first and second ears 31, 32 extending laterally beyond the first and second neck wall members 14, 15 respectively. The first and second ears 31, 32 can be knocked off the head portion 9 with a bolster or similar as a result of the notches 33,34 forming weak points in the rear face 5 at the ears 31, 32. Figure 11 depicts two blocks 1D, 1E of a course with their ears 31, 32 bolstered off and laid in a tight convex curve. Figure 11 also shows that the body side wall surfaces 35, 36 are tapered at an angle sufficient to make full use of the reduced width of the head portion 9 when the ears 31, 32 have been bolstered off without creating any gaps between the front faces 4 of laterally adjacent blocks. Figure 12 depicts how a third block 1F laid in the next setback course interlocks with the first two blocks 1D, 1E. The tight convex curve results in the pins 50 protruding from the first and second pin holes of the lower blocks 1D, 1E engage the rear walls 22F, 23F of the pin receiving cavities 18F, 19F toward the inner ends thereof. When forming a concave curve, the pins would engage the rear walls 22F, 23F of the pin receiving cavities 18F, 19F toward the outer ends thereof.

A retaining wall formed of courses of blocks of the preferred embodiment can be reinforced with the use of rebar and grout. An example of such a reinforced wall 200 is depicted in Figure 13. Lengths of rebar 90 are inserted into at least one of the continuous cavities 38 defined by neck openings 13 and vertically adjacent side voids 11, 12 of blocks in alternate courses. The cavities 38 are then filled with grout 91 to encase the rebar 90. This form of reinforcing is particularly applicable to vertical or minimum setback walls with blocks interlocked using the third and fourth pin holes 29, 30, but can also be used for larger setback walls, where the cavities 38 defined in the wall will still be continuous but will be inclined at an angle equal to the setback angle of the wall. Alternatively, the wall may be reinforced by placing threaded rods through the cavities and using conventional post-tension techniques.

The retaining wall can alternatively be reinforced with the use of a reinforcing geogrid tie back in a similar manner to that disclosed in Forsberg, US Patent No Re. 34,134. A vertical retaining wall 300 depicting the use of such a tie-back 92 is shown in Figure 14. The tie-back 92 is a generally flat sheet of material arranged as a grid, typically formed of high strength plastics material or steel, which is placed between courses of blocks 1 in the retaining wall and extends rearwardly into the fill behind the wall 300 to anchor the wall against forces tending to topple the wall forward. The pins 50 interlocking the blocks of adjacent courses are passed through apertures of the tie-back grid 92 so as to assist fixing of the tie-back 92 between the courses. The configuration of the preferred block which ensures the neck wall members 14, 15 of

interlocked blocks overlap in line with the pins 50 helps resist pull-out of the tie-back reinforcement 92.

Figures 14 and 15 also depict the integration of fence posts 93 into the top of the retaining wall 300. The posts 93 of the fence 94, or of similar structures such as guardrails, can be inserted into the cavities 38 formed by the neck openings 13 and side voids 11, 12 of the blocks of alternate courses and secured if necessary with grout 91 or other fill. A single sign post could also be secured to the wall in such a manner. Due to the relatively short embedment depth of the preferred embodiment, reinforcement of the structure is typically necessary when placing fence posts 93 in the cavities 38. Figures 14 and 15 depict geogrid reinforcement foe this purpose.

The shape of the preferred block 1 incorporating head, neck and body portions 9, 7 and 8 also enables the construction of a retaining wall incorporating pilasters for aesthetic or other purposes. Figure 16 depicts such a retaining wall 400 incorporating a pilaster 95 formed of a vertical column of blocks 1 set forward from the remainder of the vertical retaining wall 400. In every second course (here the bottom, middle and top courses) the ears 31, 32 of the blocks of the pilaster 95 are disposed in the side voids 11, 12 of the laterally adjacent blocks. Preferably, the shoulders 39, 40 of the body portion 8 of these blocks engage the outer side surfaces 26, 27 of the front face 4 of the laterally adjacent blocks. In the alternate courses it is preferable to provide truncated blocks 70 laterally adjacent to the pilaster blocks, these truncated blocks being used to fill the gaps which would otherwise be formed in the front face of the wall. The truncated blocks can be formed by cutting half blocks 60 to reduce their width as required. The blocks of the pilaster 95 are interlocked in vertical alignment with pins in the third and fourth pin holes 29, 30 of a given block engaging the first and second pin receiving cavities 28, 19 respectively of the block immediately above. Alternatively, if constant cross-section pins or rods (which would extend through multiple blocks) are used, it would be possible to interlock the blocks of the pilaster 95 using the first and second pin holes 16, 17 with the pins protruding into the first and second pin holes 16, 17 of the next lowermost block rather than the pin receiving cavities. Setback walls with incorporation of a sloping pilaster can also readily be achieved in a similar manner, with pins in the first and second pin holes 16, 17 of each pilaster block engaging the pin receiving cavities 18, 19 of the next lowermost block in the pilaster.

The blocks 1 are typically manufactured of concrete and cast in a high-speed masonry block or paver machine. The block is formed inverted to allow for forming of the pin receiving cavities 18, 19. The pin receiving cavities 18, 19, neck opening 13 and pin holes 16, 17, 19 and 30 are formed using cores. The pin holes extend through the depth of the block to enable the pin-hole forming cores to extend to the top face (which forms the bottom surface during casting). The pin receiving cavities extend only through a portion of the depth of the block to enable the pin receiving cavity forming

cores to extend from the bottom face (which is the top surface during casting). The blocks 1 are formed as mirror image pairs joined at the front face 4 which are then subsequently split using a standard block splitter in the usual way to provide a rough front face 4 on the split blocks 1. Alternatively, other methods may be used to form a variety of front face surface appearances. Such methods are well known in the art.

DATED this First Day of October 1998
Keystone Retaining Wall Systems, Inc.
Patent Attorneys for the Applicant
SPRUSON & FERGUSON

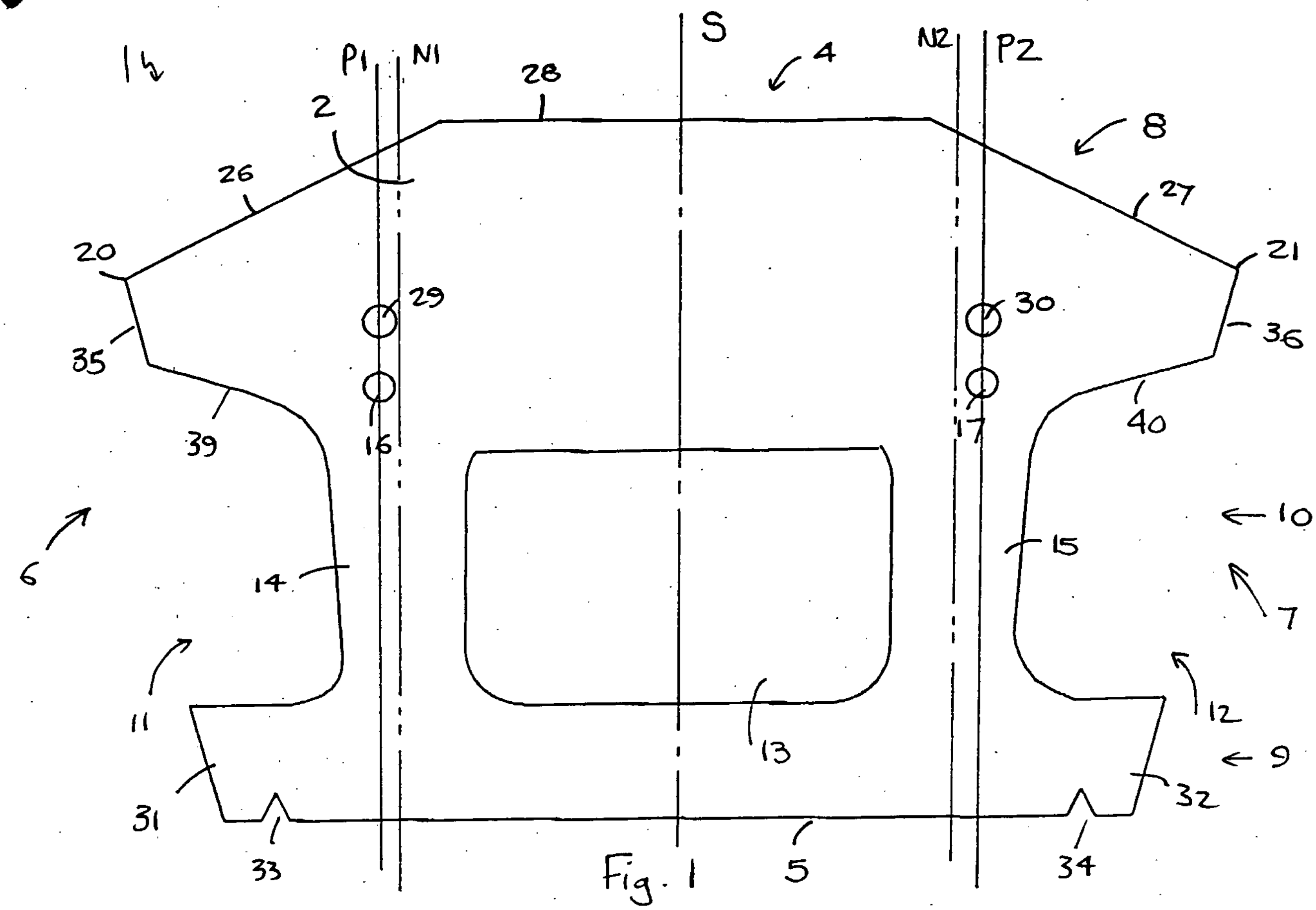

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Fig. 1

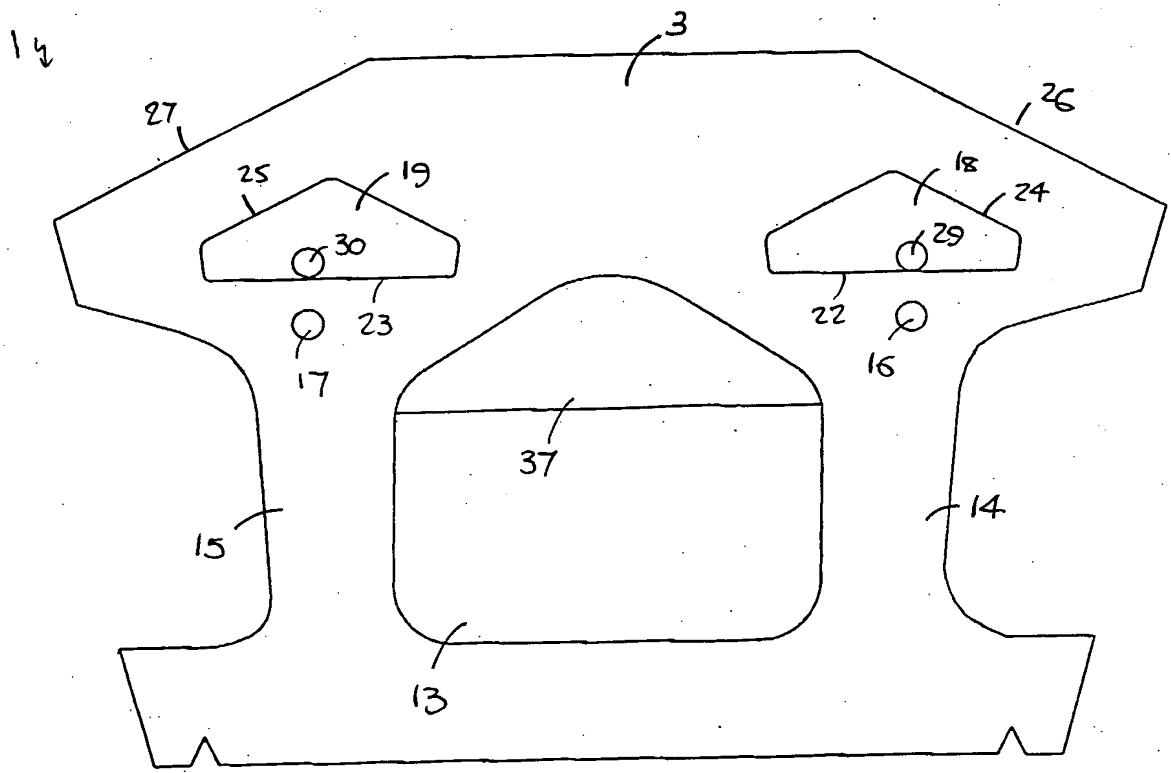

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Fig. 2

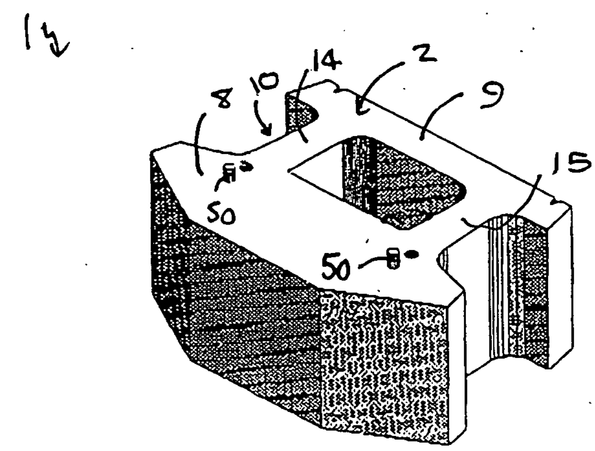

Fig. 3

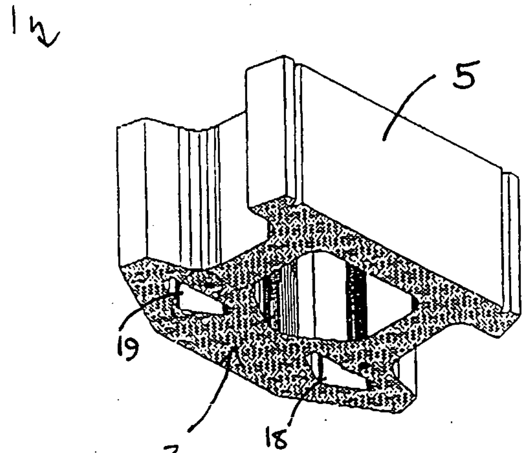

Fig. 4

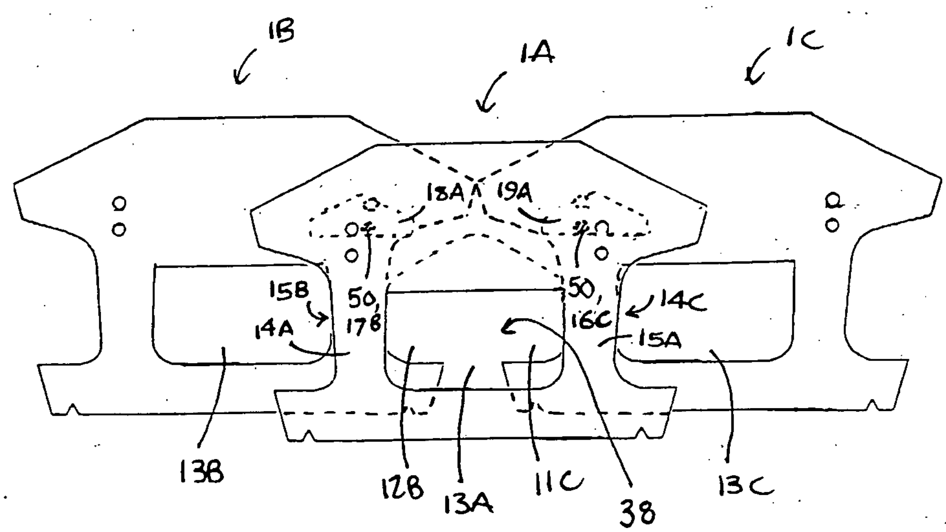

Fig. 5

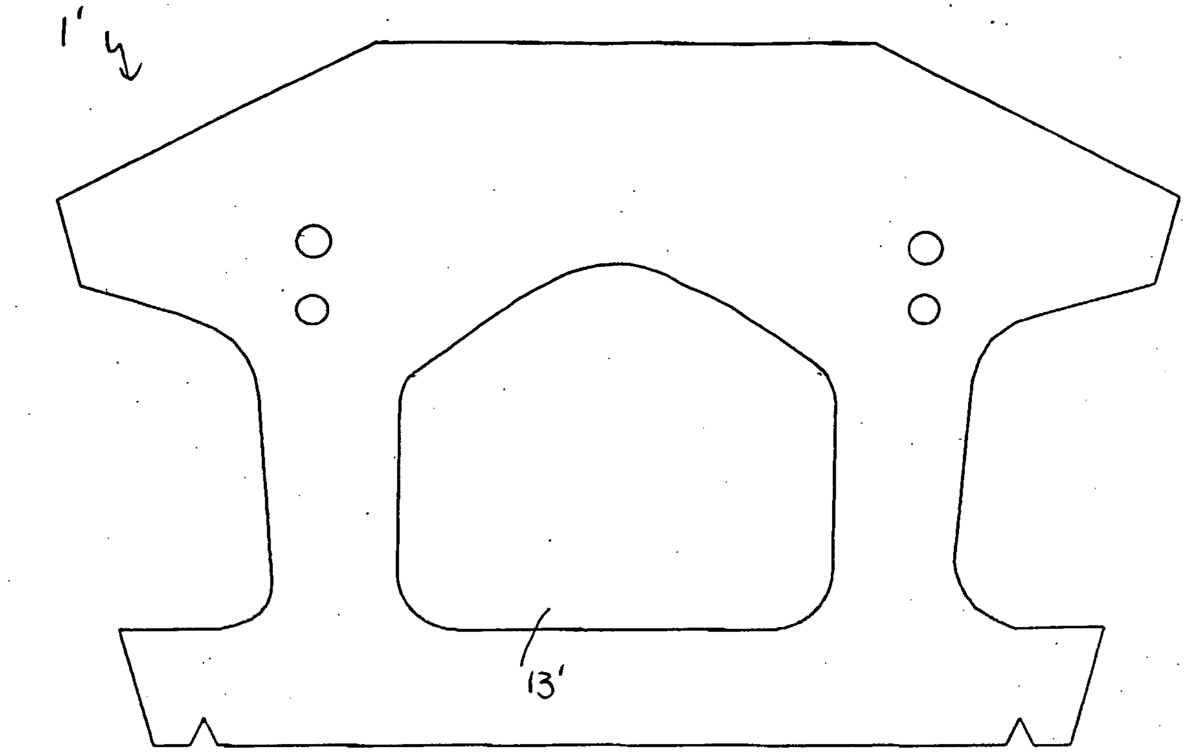

Fig. 6

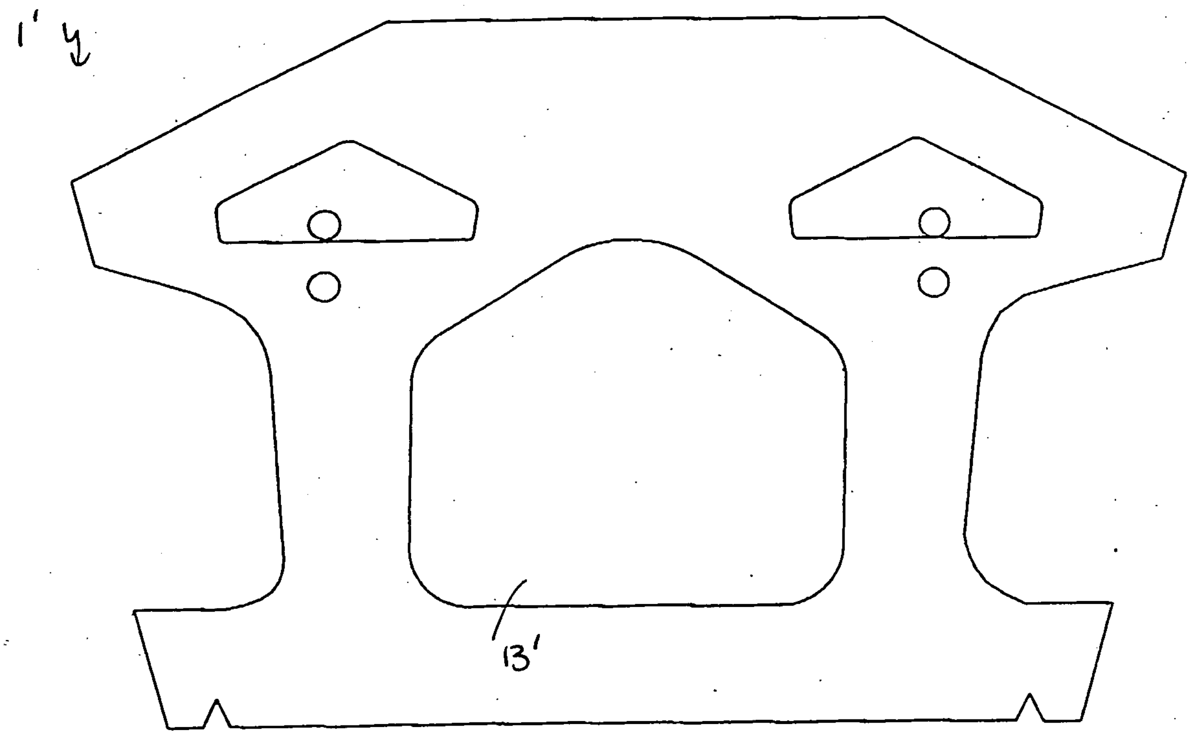

Fig. 7

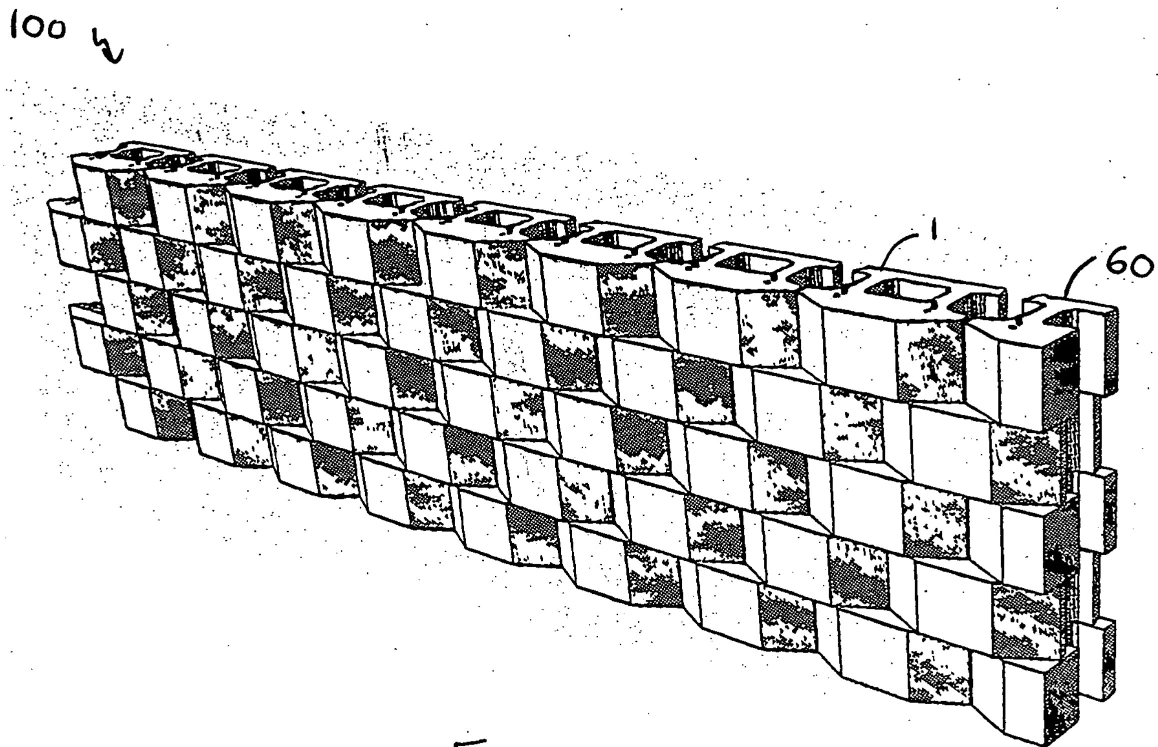

Fig. 8

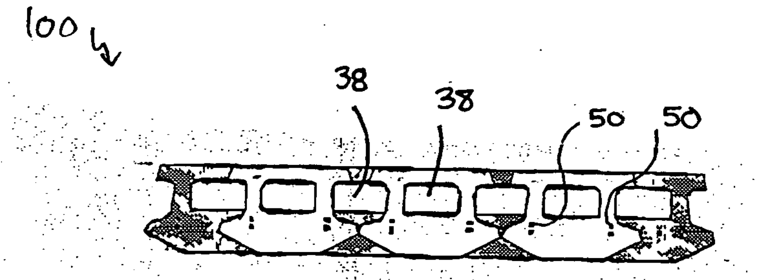

Fig. 9

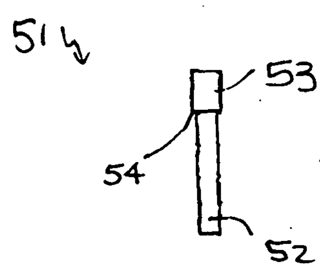

Fig. 10

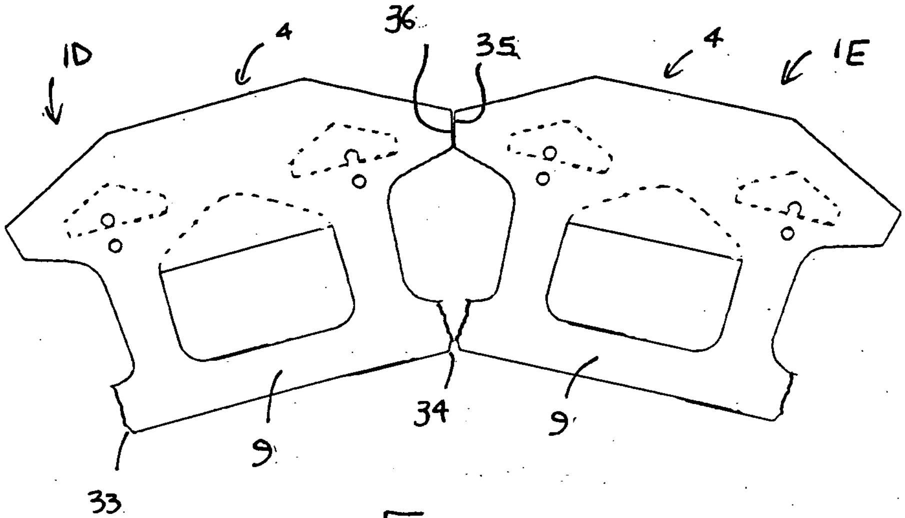

Fig. 11

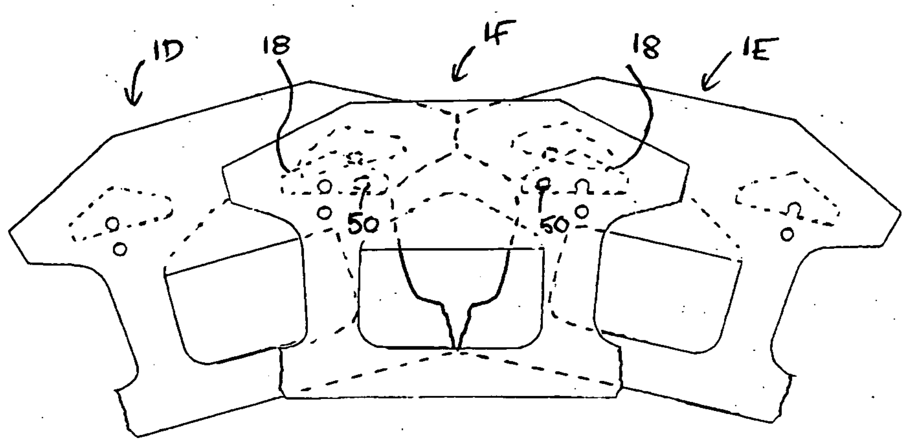

Fig. 12

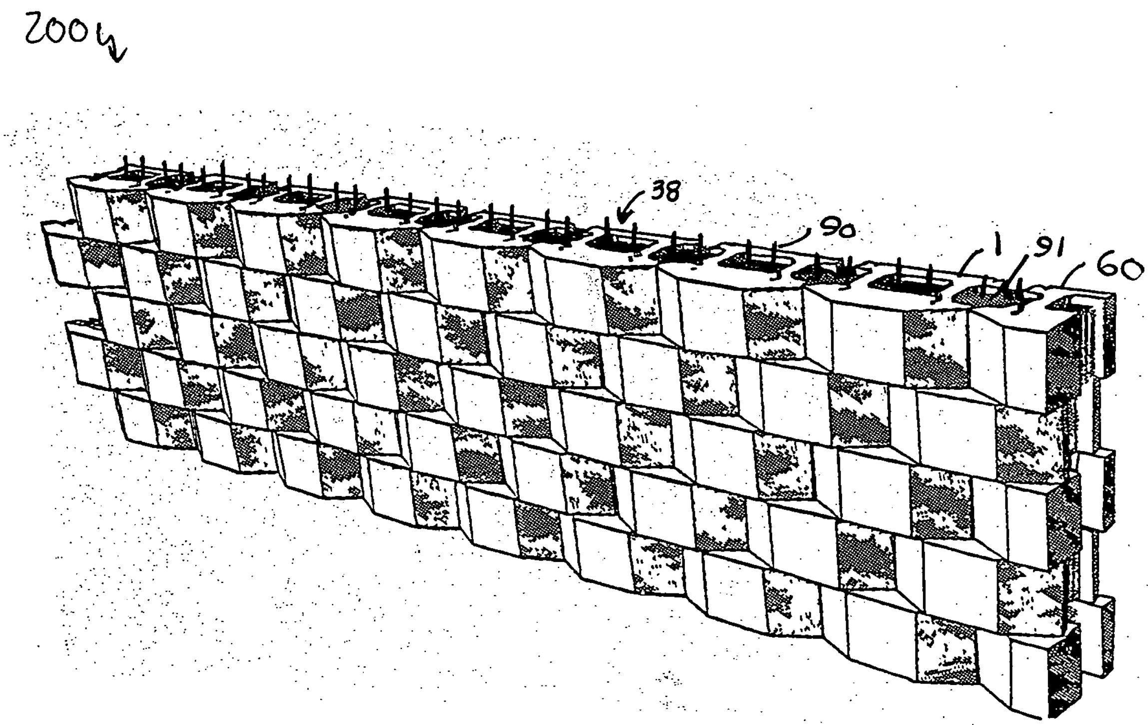

Fig. 13

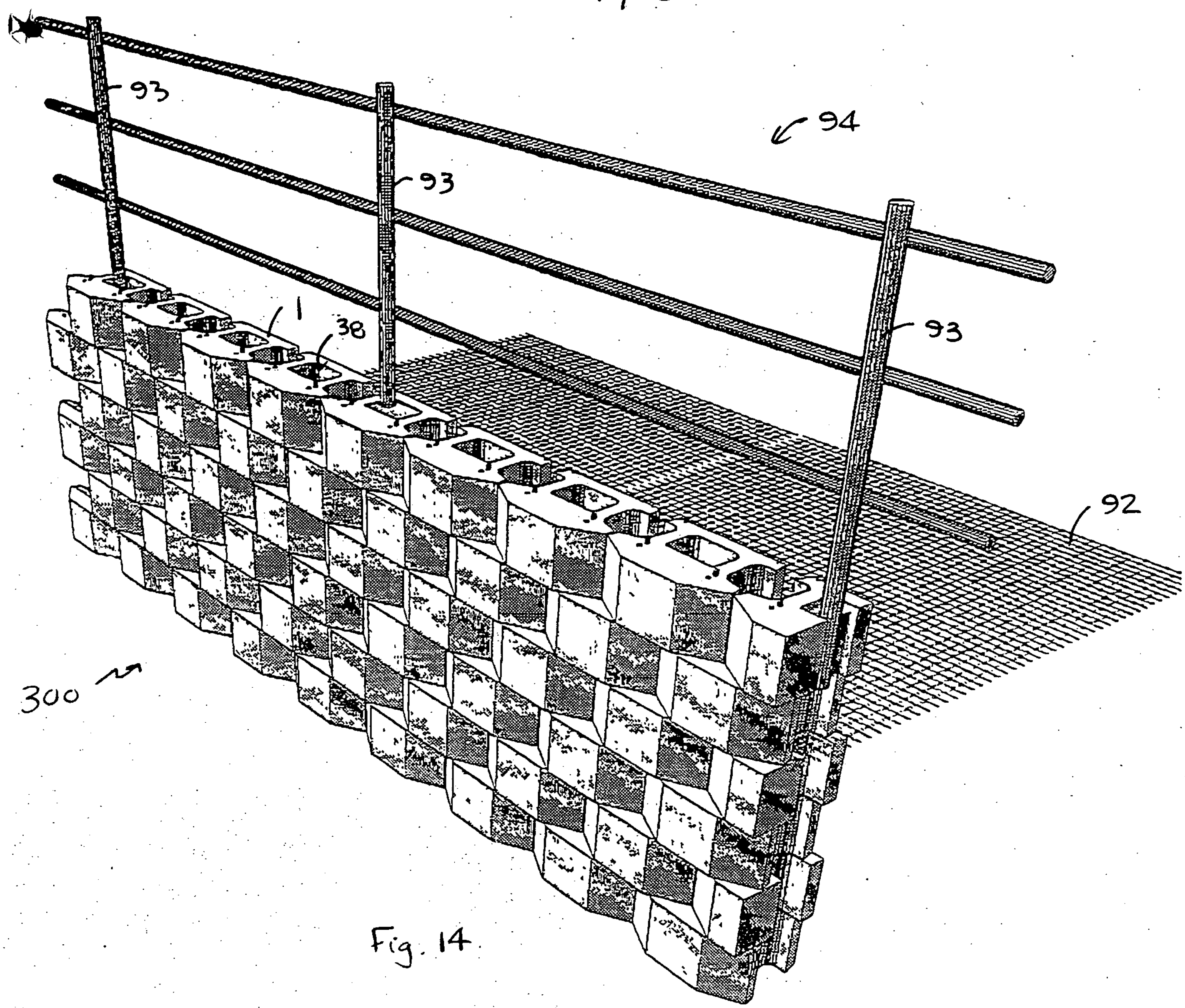

Fig. 14

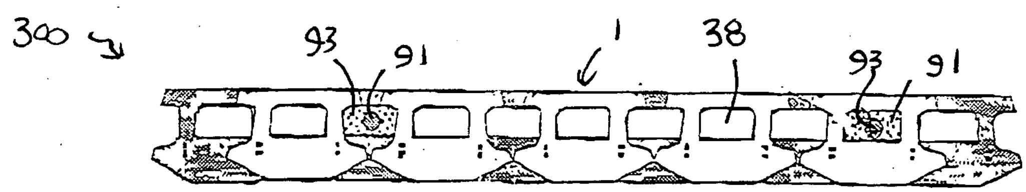

Fig. 15

400

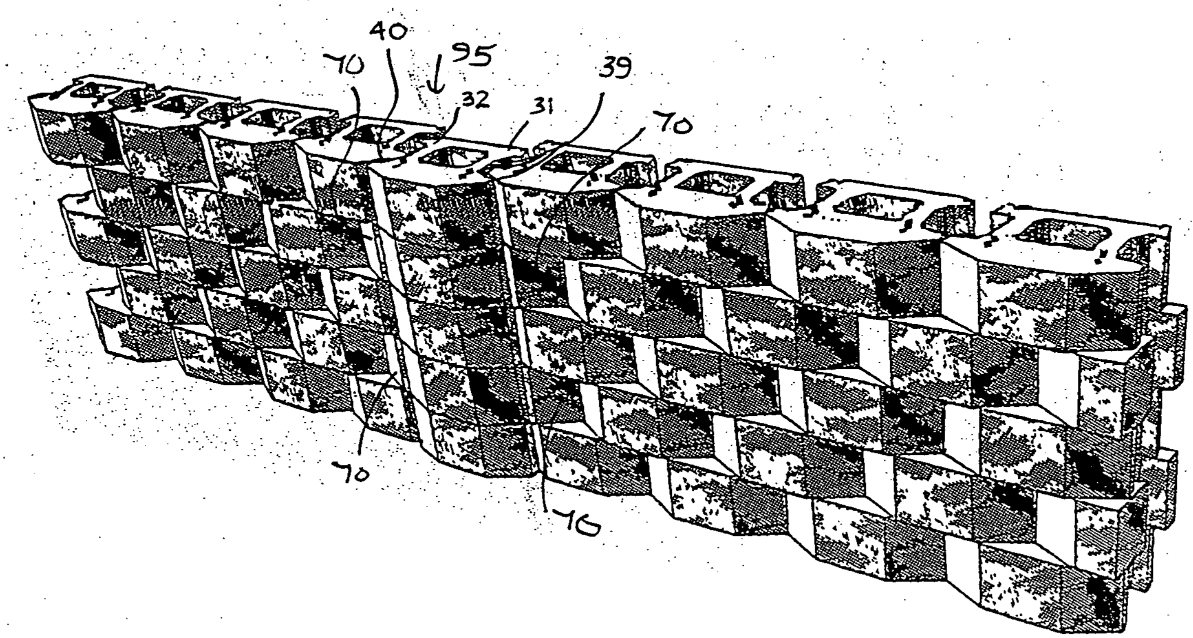

Fig. 16